



University of Toronto

Institute for Environmental Studies



Graduate Calendar 1986–1987

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INSTITUTE FOR ENVIRONMENTAL STUDIES

Members of Teaching and Research Faculty,
other Cross-appointees and Research Associates

P. Aird, B.Sc.Agr., M.S., Ph.D.	Forestry
S.C.H. Barrett, Ph.D.	Botany
J. Bendell, Ph.D.	Zoology
T.J. Blake, M.F., Ph.D.	Forestry/Botany
I. Burton, M.A., Ph.D.	Geography
P. Byer, S.B., S.M., Ph.D., P. Eng.	Civil Engineering
K. Davies, D. Phil.	City of Toronto Dept. of Public Health
D.N. Dewees, B.Sc., L.L.B., Ph.D.	Political Economy/Law
J. Donnan, Ph.D.	Ministry of Environment
J. Dooley, B.A.Sc., M.A.Sc., Ph.D.	Management Studies
G. Feuer, Ph.D., C. Med.Sc., FRCP	Pharmacology
A.P. Grima, M.A., Ph.D.	Geography
F.K. Hare, O.C., B.Sc., Ph.D.	Geography
H.H. Harvey, B.Sc., M.Sc., Ph.D.	Zoology
M. Havas, B.Sc., Ph.D.	Environmental Studies
J. Hoeniger, Ph.D.	Microbiology
K. Howard, B.Sc., Ph.D.	Geology
T.C. Hutchinson, B.Sc., Ph.D., FRCP	Botany/Forestry
W.N. Irving, B.A., Ph.D.	Anthropology
R. Jaakson, Ph.D.	Geography
M. Jones, B.Sc.	ESSA Ltd.
P.H. Jones, B.A.Sc., M.S., Ph.D., P. Eng.	Civil Engineering
W. Kalow, M.D., F.R.S.C.	Pharmacology
D. Mackay, B.Sc., ARCST, Ph.D., FCIC, P. Eng.	Chemical Eng.
V. Maclaren, Ph.D.	Geography
K. Neuman, Ph.D.	Ministry of Environment
W. Michelson, Ph.D.	Sociology
J.E. Paloheimo, M.A., Ph.D.	Zoology
R.C. Plowright, Ph.D.	Zoology
H.A. Regier, B.A., M.Sc., Ph.D.	Zoology
A. Rotstein, B.A., Ph.D.	Political Science
D.N. Roy, Ph.D.	Forestry
P.M. Stokes, B.Sc., Ph.D.	Botany
R. Stren, B.A., M.A., Ph.D.	Political Science
J. Swaigen, B.A., L.L.B., L.L.M.	Ministry of Environment
V.R. Timmer, Ph.D.	Forestry
P. Timmerman, B.A., M.A.	Environmental Studies
C. Trick, B.Sc., M.Sc., Ph.D.	Environmental Studies
C. Tuohy, B.A., M.A., Ph.D.	Political Science
J.C. Van Loon, B.Sc., Ph.D.	Geology/Chemistry
P.G. Wells, Pharm.D.	Pharmacy/Pharmacology
J. Westgate, Ph.D.	Geology
D. Whelpdale, Ph.D.	Atmospheric Environment Service
R. White, B.A., M.Sc., Ph.D.	Geography
J.B.R. Whitney, M.A., Ph.D.	Geography
R.C. Wyndham, Ph.D.	Botany

School of Graduate Studies Environmental Studies Programme
Committee

P.M. Stokes Director IES (ex-officio)
W.N. Irving (Anthropology)
S.C.H. Barrett (Botany)
T.C. Hutchinson (Chairman)
D.N. Roy (Forestry)
J.B.R. Whitney (Geography)
J. Westgate (Geology)
C. Tuohy (Political Science)
W. Michelson (Sociology)
R.C. Plowright (Zoology)

Honorary Life Members

Dr. F.E.J. Fry	November, 1978
Dr. A.D. Misener	November, 1978
Dr. G. de B. Robinson	November, 1978
Dr. F.K. Hare	November, 1979
Dr. D.V. Anderson	November, 1980
Miss J. Retel	May, 1981
Mr. N.R. Sprankling	May, 1981
Mrs. F.E. Blair	June, 1982
Dr. I. Burton	August, 1984
Dr. R.E. Munn	March, 1985

PREFACE

If you are a graduate student considering the Institute for Environmental Studies at the University of Toronto as a place where you could pursue your research and studies at the Master's level, you need to have as much information as possible about the challenges and opportunities of the programme of studies as well as about housing, financial assistance and probable costs. More specifically, you need to gain an understanding of the distinctive interdisciplinary character of IES and its programme of study and research.

This calendar has been prepared primarily for prospective graduate students in Environmental Studies at the University of Toronto. It provides applicants and their advisers with sufficient information to assess the opportunities for graduate studies and research and should assist in outlining a tentative programme of study.

There are other easily available and valuable sources of information: several of the departments collaborating with the Institute (Anthropology, Botany, Forestry, Geography, Geology, Political Science, Sociology, Zoology) have full time student counsellors, have published their own requirements for all graduate programmes and have a full listing of financial assistance and areas of research.

Individual applicants will have their own special questions. All enquiries regarding the programme in Environmental Studies should be directed to:

Professor T.C. Hutchinson
Coordinator of Graduate Studies
Institute for Environmental Studies
170 College Street
Haultain Building
University of Toronto
Toronto, Ontario, Canada M5S 1A4
Telephone: (416) 978-4283

SCOPE AND PURPOSE OF IES

The Institute for Environmental Studies at the University of Toronto is an interdisciplinary centre for environmental research and graduate training which offers association with a wide range of academics in the natural and social sciences. The primary goal of the Institute is to provide the facilities and academic climate for problem-oriented research for those who wish to maintain their discipline-based academic work. In addition to the faculty members from the eight departments who offer collaborating M.A./M.Sc. programmes with the Institute, there are many Associates from other University departments, as well as Government agencies and private consultants.

In 1969, a programme in Environmental Studies was set up which secured a major developmental grant from the Department of Energy, Mines and Resources. On June 24, 1971, the Board of Governors of the University of Toronto ratified a statute creating an Institute of Environmental Sciences and Engineering

(IESE). The former Great Lakes Institute, which was set up in 1960, was incorporated into IESE. In 1974 the title was changed to the Institute for Environmental Studies (IES) in order to reflect a broader academic base in Economics, Law, Forestry, Geology and Earth Sciences, adding to the original strength in Engineering, Zoology, Botany, and Geography.

The Institute for Environmental Studies exists to foster research into the complex relationships between man and his environment and to discover ways and means of understanding and improving them. For several years it has conducted research into (1) the quality of the environment, a term that covers such things as environmental toxicology, anthropogenic stress on ecosystems, air, soil and water pollution, pesticides, heavy metal toxicity and acidic precipitation and (2) environmental management, focussing on such questions as water resource management and environmental impact assessment. At present, its programmes include ecosystem rehabilitation, hazardous waste management, renewable resource yield and management, and the consequences of energy generation and use. Environmental perception and risk assessment, closely allied to environmental policy, are receiving a great deal of attention.

Such studies need the skills of many disciplines. The members of the Institute come from all over the University. Some are lawyers, geographers and economists, concerned with the institutional aspect of man's use of the environment. Some are natural scientists, such as zoologists, botanists, geologists, climatologists and chemists, whose skills help unravel the functioning of the natural systems that surround us, and which we drastically modify. Still others are architects, planners and engineers. All are bound together by the conviction that they need the help of the others to do their own environmental work. They form a number of study groups or working groups, focussing on specific problems or issues, e.g. drinking water quality, acid rain impacts, water resources of the Great Lakes.

The Institute Working and Study Groups have proven to be a very successful means of organizing people from diverse disciplines and departments around problems of common interest. Formed either to resolve specific problems or to study fields of current interest, they often receive funding, produce reports and publications, and provide resources for the University and surrounding communities. Currently active groups are involved in Acid Precipitation, Arctic Studies, Climate and Human Response, Project Ecoville, Environmental Ethics, Environmental Perception and Policy, Great Lakes Rehabilitation, Heavy Metal Effects, Oil Pollution, Resource Accounting, Snow and Ice Control, Solid and Hazardous Waste, and Drinking Water Quality.

The Institute is an integral part of the School of Graduate Studies (SGS), and is housed in the Haultain Building on the St. George Campus. It has excellent facilities in its Resource Centre and specialized laboratories. The Canada Centre for Inland Waters in Burlington, the headquarters of the Atmospheric Environment Service in Downsview and the Ontario Government ministries in nearby Queen's Park are some of the facilities that offer unrivalled opportunities for study and

research. In addition the members of the Institute have ready access to the libraries, faculty, programmes of study, and computer facilities of one of the largest and most prestigious universities in North America. Field studies are carried out both within Canada and the U.S.A. as well as in Africa, Asia and Europe.

The structure of the Institute is as flexible as we can make it, because the proper study of the human environment demands that we should respond to needs and if necessary escape from the rigidities of specialization. Of course we do not always fully succeed - but we try. We try also to remain in the closest touch with society at large, and with industry and government in particular. The Institute is an exciting place to work.

DIRECTOR'S FOREWORD

We believe that our Institute and its graduate programme is genuinely interdisciplinary. The nature of environmental problems is such that several approaches to intellectual enquiry may be called upon to contribute to study, analysis and possible solution. It would be impractical for the Institute to try to replicate the disciplinary strengths of the University and we do not seek to do so. What has been developed therefore is a highly flexible structure in which the diverse resources of the University can be drawn upon as needed. The Institute has a number of cross-appointed faculty (ranging from 20-50%) from some ten University departments, a larger number of 'status only' cross appointments and an even larger number of Associates who are engaged from time to time in its diverse activities, but whose main work is done within the programme of a department or a college or outside the University.

The Institute is research oriented and we develop and carry out interdisciplinary research in Working and Study Groups. Such groups consist of a number of faculty, associates, staff and students working together under the general direction of a coordinator. Membership in the Working and Study Groups affords students an excellent opportunity to experience the excitement and frustrations of interdisciplinary communication and collaboration. We believe that we have developed substantial skills in this area that can best be passed on to a student through practical experience.

The Institute is also a network organization that thrives on the development of links and connections that could not as easily be made through single departments. There is therefore a policy of minimizing bureaucracy and of avoiding complex hierarchical structures, as these tend to be counter-productive to the operation of a network. The network of the Institute is more like an extended family that draws into its activities a dynamic array of experts and professionals. The network extends well beyond the limits of the University of Toronto. For example, the Working and Study groups include active involvement by people from all those levels of government and the private sector who share our concern for environmental issues.

To maintain continuity and to provide a continuing commitment to the teaching programme, the Institute has a relatively small group of faculty members who teach graduate courses and who maintain their major offices in the Haultain Building. The teaching staff and those whose offices are in the Haultain Building, however, do not constitute the Institute. The wide reach of Institute work would never be possible on such a basis.

The special opportunities that the Institute provides for its students also entail some additional responsibilities. Like the faculty, the students all have another "home" elsewhere - usually in one of the collaborating departments. This helps to ensure that the channels of interdisciplinary communication are kept open and 'peer review' is perpetuated.

Being an IES student also means taking on a heavier work load. Institute students satisfy the basic degree requirements of a department and also take IES "core" courses. They sit on committees and organize seminars. This, together with research work, means that students' days (and nights) at the Institute are always busy. The pressure of work is substantial and not for the faint-hearted.

There are other features of Institute life that are important. The faculty, the administration, secretarial and laboratory staff, and the students join in an active "social" programme in which talk about research, environmental issues and somebody's latest brainwave are mixed with pleasant activities such as Institute lunches, parties, and retreats. An important fixture is the graduate volleyball team, which has enthusiasm and, sometimes, talent. Students take a leading role in initiating and organizing these events. Surprisingly, there is never a shortage of willing helpers. Why this is, is hard to say. Perhaps (the faculty like to think) it is because of the infectious example set by faculty. Perhaps it is because the Institute has been lucky enough to attract an extremely capable, energetic and enthusiastic group of students. Certainly if you are looking for a quiet life, and want to be left alone, the Institute is not the place for you.

When asked to explain to outsiders the special character of IES, a variety of things are commonly mentioned including the intellectual climate, the congenial atmosphere, the excellent and cheerful administrative and support staff, the enthusiasm of students, the outstanding Tuesday lunches, the excitement of interdisciplinary research and the decrepit charm of the Haultain Building. All these are valid comments. There is, however, one other important reason that I believe provides the glue to hold such a diverse group together, in a loose open network. I think an IES-type of person, faculty, staff or student is someone with a deep and abiding concern for the human environment and the quality of life that can be lived within it.

Pamela Stokes, Director

FROM THE STUDENT REPRESENTATIVES

We are pleased that you have expressed interest in studying at the Institute for Environmental Studies. This graduate calendar describes the Institute, the graduate programme and application procedures. We know, however, that in looking for a graduate school you will have accumulated a confusing array of similar information. No calendar can offer you the personal "student's-eye-view" of a school and programme, although this is crucial, in making a decision on where to pursue your studies.

As we see it, here are some of the benefits of following the IES collaborative programme in environmental studies rather than a conventional departmental programme:

1) Interdisciplinary study: core courses taken by students from a range of departments, taught by instructors from a similar range of departments as well as from outside the University.

2) Smaller class size: graduate participation only, which is not always the case in departmental courses.

3) Institute working groups, seminars, etc: a valuable forum for instructor/student interaction.

4) Internships: an effective bridge to career/study contacts. (One point we should note is that the student is responsible for securing the internship. While the Institute can assist in identifying potential employers and organizing interviews, incoming students should not expect a job to be consistently provided for them).

5) Atmosphere: the Institute provides a friendly, personal atmosphere in which to work. It is smaller than most departments, rendering the "I-feel-like-a number" syndrome obsolete.

Carol Murray and Rob Abbott,
Student Representatives on IES Executive Committee, 1985-86.

GRADUATE DEGREE PROGRAMME

Masters programmes in Environmental Studies are at present available through the Institute in collaboration with the Graduate Departments of Anthropology, Botany, Forestry, Geography, Geology, Political Science, and Zoology. A similar programme is being set up with Sociology.

The students in the collaborative Environmental Studies Programme must register in one of the eight departments. This requirement reflects a basic philosophy that the interdisciplinary approach to environmental research presupposes proven competence in a relevant discipline. The M.A. (Environmental Studies) degree is available in Anthropology, Geography, Political Science and Sociology (pending), the M.Sc. (Environmental Studies) degree is available in Botany, Geography, Geology and Zoology; the M.Sc.F. (Environmental Studies) degree is available in Forestry and the M.A.Sc. (Environmental Studies) degree is available in Geology.

Admission Requirements

Admission to the programme will be subject to the approval of both the department concerned and the Institute for Environmental Studies. The requirements will typically be a four-year Bachelor's Degree from an approved University with at least a B+ average during the final year. A personal interview may be required before admission to the programme is finalized. Mature students may be considered on the basis of their career experience as well as their previous academic education.

Facility in the English language must be established by all applicants from universities outside Canada whose native language is not English. This must be done before arrival on this campus. Acceptable tests are available for students, whose admission has been recommended from:

- (a) English Language Institute,
University of Michigan
Ann Arbor, Michigan, U.S.A.
- (b) TOEFL, Educational Testing Service,
Princeton, New Jersey, U.S.A.

Where the language of the undergraduate instruction and examination has been uniformly English, evidence of an applicant's proficiency presented by one of the student's University professors may satisfy the School.

How to Apply

Students are advised to make early contact with the Graduate Coordinator of IES and of the prospective collaborative department to ascertain the nature of the joint programme. They are similarly advised to make personal contact with potential graduate supervisors as early as possible as admission to the programme may well depend on the availability of a faculty member to supervise the applicant's research and graduate study programme.

Once a student has decided to apply, he/she should obtain

the formal application package from the Admissions Office, School of Graduate Studies, 63 St. George Street, University of Toronto, Toronto, Ontario M5S 1A1 Tel: 416-978-6614. The application requires that two sets of official transcripts (with certified translation, if necessary) be sent to the School of Graduate Studies and reference letters be sent directly to the department. This is fully explained in the package. A fee of \$25 (certified cheque or money order in Canadian funds) made payable to the University of Toronto must accompany the application.

The general deadline for receipt of applications is April 15 for the following September. If places are available after that date they may be accepted, with full documentation, until July 1st (from Canada and U.S.A.) and June 1st (from other countries).

It should be noted that for students wishing to be considered for any open fellowship administered by the SGS, (U. of T. Open and Connaught), applications, transcripts and letters of reference must be received by February 1st. Early applications are encouraged as once professors have accepted their quota they tend not to consider late applications.

Notice of Acceptance

Applications for admission are considered by the graduate department and IES and their recommendation for acceptance must then be approved by the SGS. The School informs the applicant of the decision as soon as possible. Notification of acceptance sent by a department or IES is not official.

Programme of Study

The graduate programmes of study vary somewhat according to the collaborating department. Each department's Graduate Coordinator will have more information on departmental requirements. All students in the programme must also take a core of 3 one-term (normally 12 weeks) graduate courses. At present these are chosen from:

- ESE 1005H Environmental Management I
- ESE 1008H Environmental Management II
- ESE 1007H Man Environment Theory I
- ESE 1006H Man Environment Theory II

These core courses provide a common framework for students in the programme. Additional courses may be required of individual students to fill in gaps in their education, provide specialized training, or fulfil a collaborating department's requirements. One half course may be considered for substitution in this core in special circumstances, based on the student's aims and previous experience.

Each student in the collaborative programme will undertake a research project leading to a thesis or research paper depending upon the requirements of his/her "home" department. In many cases, especially where a major master's thesis is not required, it is desirable that the research project be related to an internship. The purpose of the internship is to provide students with "real world" work experience involving some environmental problem(s) related to their programme of study and research. Normally, the student would be paid a salary

during the internship; past experience suggests a wide range in rates of remuneration, depending on the type of agency or research grant supporting the internship. Three alternative models have been followed in the past few years:

- (a) Practical Internship - In this case the student would find work in a practising office (government, industry or consultant) for 4-8 months and by arrangement the student would conduct his/her research together with the staff of the interning office on such topics and along such lines as would be acceptable for the research component of their degree. Students in Geography-IES have followed this model especially.
- (b) Working Group Internship - Students may undertake a research project consistent with their programme requirements as part of a multidisciplinary working group at the Institute.
- (c) Institute/Department Internship - Students may undertake a research project supervised by two or more Institute faculty members, one of whom is cross-appointed to the relevant collaborating department.

Past experience indicates that the satisfactory placement of a student in an internship depends in large part on the initiative of the student and the assistance of his/her supervisor and other faculty members. The student grapevine has produced results, too.

Most students require two years to successfully complete the collaborative programme. It is possible to finish in less time. Programme fees for 1.5 sessions will be assessed by the School of Graduate Studies and there is a 16-month residence requirement for the joint programme. Consideration is being given to a reduction in fee requirements to one year with a 12-month minimum residence requirement.

Graduate Student Supervisory Committees

Regardless of the departmental requirements which vary, it is required that IES collaborative programme students have a supervisor (or at least an adviser if the thesis supervisor is not selected at the start of the programme) who would normally be from the collaborative department, plus at least two other advisers to form a supervisory committee. One member should be on the IES faculty from another department or discipline. Additional members, e.g. from the government or private sector, are welcomed. The committee should meet with the student at least twice a year (generally once each term) and members would usually be consulted on an individual basis throughout the year as appropriate. The Graduate Coordinator should be informed of the composition of the committee and that the required meetings have taken place.

Toxicology Programmes

Coincident with the development of the Guelph-Toronto Canadian Centre for Toxicology, graduate training programmes are being developed in toxicology. The programme at Toronto is now in place for both the Master's in Toxicology and for the Ph.D. These programmes are officially administered by the

Department of Pharmacology while a committee chaired by T.C. Hutchinson is responsible for considering and advising all applicants to the programme. A brochure giving further information on the toxicology programmes at Toronto can be obtained from Dr. Hutchinson at IES.

Employment Opportunities

Part of the rationale for the joint programme is that it may enhance the chances of employment for graduates. Government agencies and consulting firms normally prefer to hire graduates who have specific and specialized skills (e.g. laboratory work experience, data analysis, research report writing, computer skills) in a recognized academic field such as Botany, Zoology, Geography, Forestry, etc. Candidates for the joint degree would master such skills in their home discipline. In addition, they gain experience in interdisciplinary environmental research and communication and this is expected to give them some advantage in the labour market. This experience should also make graduates from the joint programme strong candidates for positions that require research skills and a broader perspective on environmental issues (e.g. in the media and with public interest groups). So far the graduates from the programme have found employment with government agencies, consulting firms, a political party and a public interest group. Other graduates are proceeding to a Ph.D. in their field of specialization. Some earlier Ph.D. students are now faculty members at Canadian and USA universities.

Students Not Enrolled in Environmental Studies

Graduate students registered in individual departments may enrol in courses offered by the Institute. Such students must first be registered in a graduate department of the University. The current Calendar of the School of Graduate Studies should be consulted for details of graduate programmes and admission regulations and procedures. Many departments publish a brochure describing the departmental procedures for admission, research activities, financial support arrangements, course requirements, and general facilities.

The Institute is pleased to assist all students interested in pursuing environmental studies by directing them to the appropriate department or faculty and by giving advice on courses in the environmental field.

Environmental Engineering Programme

A co-operative Environmental Engineering Programme in the Faculty of Applied Science and Engineering is available to qualified applicants. Students interested in Environmental Engineering must apply to and register in one of the participating departments (Civil, Chemical, Industrial or Mechanical Engineering) and follow a course of studies acceptable to the department in which they are registered and to the Interdepartmental Programme Committee which administers the programme. Additional information is available from Professor D. Mackay, Chairman, Environmental Engineering Programme, Haultain Building, University of Toronto (Telephone 416-978-3141 or 978-4019).

Undergraduate Environmental Studies - Innis College

Innis College runs specialist undergraduate programmes in environmental studies, including options in both B.Sc. and B.A. areas. Though not part of the IES mandate, faculty members teach in and collaborate with the Innis programme and act on its Advisory Body. For more information phone 978-7023

FINANCIAL ASSISTANCE

Fellowships, Studentships, Scholarships and Bursaries

The University of Toronto Open Fellowships are awarded by the School of Graduate Studies to outstanding applicants from Canada and abroad. All new students who formally apply to the School of Graduate Studies by February 1st and all continuing students will automatically be considered for University of Toronto Open Fellowships. Applications received at the School after February 1 cannot be considered for these Fellowships but can, of course, be considered for admission.

Other fellowships awarded by government and other agencies may be available through the collaborating departments and the student is advised to contact departments for further information. Some also carry residence requirements. At the time of application, the department or the Institute will try to advise outstanding applicants about fellowships for which they may apply. Applicants should also consult the section on Financial Assistance in the SGS Calendar. The Office of Student Awards, 214 College Street, Toronto has extensive listings of awards.

The following is a very small indication of available scholarships and awards:

	<u>Application Deadline</u>	<u>Approx. Value</u>
Connaught Scholarships	February 1	\$9000 & fees
U. of T. Open Scholarship	February 1	\$2300/term
Natural Sciences and Engineering Research Council of Canada	December 1	\$11600/annum
Ontario Graduate Scholarships	December 1	\$2435/term
Emergency Planning Canada	February 1	\$10810 & fees
Ontario-Quebec Exchange Fships	January 31	\$8000

Research Assistantships

Funds in this category are usually obtained by a teaching staff member to be used for some specific research problem. The staff member may then make an award to a student to carry out portions of the research work under his supervision. Usually this work constitutes part of the thesis work of the student. The amount of money available for students acting as Research Assistants varies considerably.

Teaching Assistantships

Each of the collaborating departments employ a limited number of graduate students as teaching assistants and enquiries should be directed to departmental chairmen concerning the availability of such positions. Many students in the Collaborative programme are appointed as paid T.A.s for undergraduate courses.

Loans and Bursaries

Limited funds and loans are available for emergencies and financial contingencies which could not have been anticipated. More information is available in the Calendar of the School of Graduate Studies.

Outside Employment

Normally no outside employment may be accepted during the residence requirements of the degree unless the work is part of the academic programme. To accept employment outside the University, students on a student visa are required to obtain a work permit from the Department of Manpower and Immigration. Foreign students should therefore not plan on outside employment in order to finance their studies, unless they have first obtained a work permit. This also applies to spouses of foreign students. Foreign students who are awarded a teaching assistantship will also require a work permit.

FEES

Fees for 1 session (or 1 year)

Canadian citizens/landed immigrants - full time	\$1300.00
Post-programme (i.e. after completion of "residence" requirement)	\$520.00

Visa Students -

Full time	\$6622.00 - high	\$2998.00 - medium
Post-programme	\$2649.00 - high	\$1199.00 - medium

Incidental fees for 1985/86 were \$166.25 for full time students, and \$64.50 for post-programme students.

Cost of Living

The cost of living in Canada, particularly in Toronto, is very high. It is difficult to estimate the cost of living as people's requirements vary considerably. The following is a rough estimate of what it might cost a single student to live in Toronto for 12 months (1985 figures):

Accommodation and meals	\$5230
Clothing	475
Books	475
Health Insurance	360
Miscellaneous	1475
TOTAL	\$8015

Foreign Students

Students from abroad should note carefully the high tuition fees, the Canadian cost of living and the usual (two years) length of the collaborative programme. THEY ARE URGED TO INVESTIGATE AT AN EARLY DATE AWARDS AND SCHOLARSHIPS IN THEIR OWN COUNTRIES which would enable them to meet the heavy financial costs of studying abroad. Unfortunately, non-Canadian students are presently ineligible for many Canadian scholarship programmes.

OFFICE SPACE AND RESEARCH FACILITIES

Most IES graduate students are given office/desk space at the Institute. Access to the appropriate research facilities and laboratories will be made available through the Institute or the collaborating department.

Students will have ready access to the University of Toronto Computing Services (UTCS) which is one of the largest facilities in North America. The UTCS include three large processors, several small processors, and many input/output and storage units. Several graphical input/output devices are available. Both interactive and batch modes of access to the computers are possible.

Students also have ready access to the impressive library resources of the University and of government agencies. The University collection as of 1980 consisted of 5.5 million volumes, in addition to an unparalleled map collection. The Resource Centre at the Institute has a collection of research reports and reference material of special interest to researchers in Environmental Science, Monitoring and Impact Assessment, Water Resources and Limnology (particularly the Great Lakes).

GENERAL INFORMATION

Housing

Off-campus accommodation is listed by the Housing Service, 214 College Street, Toronto M5T 1R2. University apartments suitable for married students and within walking distance of the campus are available and inquiries should be directed to the Housing Service.

The St. George Graduate Student Residence accommodates about 300 single men and women students. For more details write to the Warden, 321 Bloor Street West, Toronto, Canada M5S 1S5.

Other on-campus residential facilities for graduate students are offered by Massey College, 4 Devonshire Place, Toronto, M5S 2E1; the Campus Co-operative Residence Inc., 395 Huron Street, Toronto M5S 2G5; Tartu College, 310 Bloor Street West, Toronto M5S 1W4.

Health Services

The University Health Service provides the full services of physicians and psychiatrists. All students are advised to join the Ontario Health Insurance Plan (OHIP) as soon as they arrive. Application forms are available at the Medical Clinic, 214 College Street, Toronto, Ontario M5T 2Z9 (586-8030).

Graduate Students Union

Every graduate student becomes a member by virtue of fees paid at registration. The G.S.U. is at 16 Bancroft Avenue and is open every weekday from 9:00 a.m. to midnight. A fully licenced bar and a gymnasium are available for use by members and guests.

Hart House

Hart House is a recreational and cultural centre on campus. All students are members by virtue of the student fees. Concerts, debates, and clubs find a home here and there are facilities for a wide variety of sporting activities.

Other Facilities Include:

The International Student Centre provides a meeting place on campus for students from Canada and abroad to come together for organized programmes or informal gatherings in a multi-cultural setting.

The St. Andrew's - University Day Nursery (117 Bloor Street East) and the Margaret Fletcher Day Care Centre (100 Devonshire Place) provide pre-school education and child care for children aged 2-5 years.

GRADUATE COURSES IN ENVIRONMENTAL STUDIES

Timetables for the Fall Term courses offered by IES are confirmed at a meeting of faculty members and interested students at the Haultain Building in the second week of September. Three core courses are an integral part of the IES Collaborative Programme.

GROUP 1 - CORE COURSES

These courses are available to any student enrolled in the School of Graduate Studies and are especially designed for students enrolled in the Collaborative Masters Programmes in Environmental Studies.

- ESE 1005F Environmental Management I
P. Byer, T. Burrell and A.P. Grima
The focus is on concepts and techniques in "rational" decision-making and the evaluation of alternative policies and designs for the management of environmental problems.
- ESE 1007S Man-Environment Theory I (Issues, Attitudes and Evidence)
H. Regier and R.C. Plowright
An analysis of positions taken by contemporary environmental advocates. Statements in the literature and those advanced by visiting speakers are examined to determine which can be supported by a coherent body of evidence and which achieve their effect through polemical means. We attempt to use logical techniques to further this aim but we recognize and extensively discuss the role of aesthetic and other effective components in environmental discourse.
- ESE 1006F Man-Environment Theory II (Adaptive Modelling of Ecosystems)
M. Jones and D. Whelpdale
Concepts and techniques of simulation modelling applied to the adaptive management of ecosystems.
- ESE 1008S Environmental Management II
P.H. Jones, P.M. Stokes and K. Davies
Emphasis on the management of toxic substances in the environment by examination of technical, ecological, regulatory and institutional perspectives. A major case study is used as a focus for seminars and a final report.

GROUP II - BASIC DISCIPLINARY COURSES

These courses are open to all graduates of this University but credit in some is restricted to students who are not specialists in the particular discipline of the course, e.g. economics for the ESE 1001H course.

- JBE 1434Y Applied Ecology/T.C. Hutchinson, P.M. Stokes and M. Havas
Principles of ecology and application to effects of pollutants on terrestrial and aquatic ecosystems. Methods of ecosystem rehabilitation. Meets two

hours per week throughout the year plus tutorials.

- JBE 1435H Techniques in Applied Ecology/T.C. Hutchinson
Laboratory techniques as applied to JBE 1434Y, Applied Ecology. Meets three hours per week throughout the year. Half course credit. Pre or co-requisite, JBE 1434Y
- ESE 1001H Economics/J. Carr
An introduction to micro-economic principles for those with a limited economics background. Topics include principles of resource allocation, the operation of market systems, the role of prices in the economy and the concept of "public goods" as it relates to pollution. Public problems of current interest that raise economic issues are used as examples.
- JBM 1437Y Microbial Ecology/J.F. Hoeniger and R.C. Wyndham
The course examines the distribution and activities in natural and man-influenced ecosystems. An introduction to the taxonomic range of microorganisms is followed by an overview of soil, lake, river and ocean ecosystems from a microbial perspective. Species' interactions are emphasized in looking at cycling of nutrients and transformations of organic and metal pollutants. Recent research on plant and animal symbioses is discussed. Laboratories in alternate weeks will familiarize the student with methods for determining the distribution and activities of microbial species in natural ecosystems.
- JNP 1014Y Interdisciplinary Toxicology/G. Feuer and Staff
Provides an overview of the factual basis and problems of toxicology. Five major divisions of the course are survey of poisons, chemical pathology, environmental effects, general principles including testing procedures and application of toxicology. A limited number of tutorial sessions will be offered on request.
- JNP 1015Y Selected Topics in Toxicology/Staff
A research project which is usually laboratory in nature, and is arranged for each student. Reading assignments are made and a written report is required. Admission in the course is subject to interview with a prospective supervisor. Assistance in locating a laboratory and prospective supervisor is available from the graduate coordinator who should also be notified of individual arrangements.

GROUP III - ADVANCED COURSES IN SPECIALIZED AREAS

In these courses, advanced specialized concepts and techniques are applied to environmental problems.

- ESE 1002F Environmental Law/J. Swaigen
An introductory course in environmental law for students engaged in environmental studies. The course deals with the legal methods available to

- resolve environmental problems and the scope and limits of those methods, common law and statutory "tools" as well as environmental assessment legislation, the problem of "standing to sue" and the limits of litigation.
- ESE 1200S Environmental Economics/J. Donnan
The application of economics to the environmental problems of pollution and resource depletion. The class will review recent literature concerning theoretical and applied work in environmental economics. The course will consist primarily of student led seminars and students should have some familiarity with economics.
- ESE 1202S Environmental Issues in Developing Countries/R. White and I. Burton
A full course outline of this new course is available in the office of the Graduate Coordinator at IES.
- ESE 1204Y Mathematical Ecology/J.E. Paloheimo
Basic quantitative methods and contemporary developments in ecological theory and resource management. Topics covered include structural and dynamic aspects of populations and communities, principles of system analysis, and input/output analysis. Some considerations of parallels between economic and ecological systems. Prerequisites: one course in statistics and in calculus; familiarity with a computer language.
- ESE 1206S Social Impacts of Environmental Change/K. Neuman
Introduces students to the approaches and techniques used by researchers and policy makers both to identify and resolve social impacts arising from environmental change. Examination and critique of approaches such as: social impact assessment, risk perception analysis, survey research on environmental attitudes, public participation in environmental policy making, mediation.
- ESE 1210F Risk Analysis and Management/J. Dooley
The course will begin by introducing concepts of risk analysis and management and their relationship to the environmental field. The course will then give the theoretical foundation needed to investigate hazardous situations in the five stages: needs, activities, release, exposure and consequences. The evaluation of risk management options will be discussed in the context of the social perception of risk and the stakeholders in decisions and their implementation. Examples will be drawn from hazardous material transportation, hazardous waste management, acid rain, energy systems, and industrial development.
- JNP 1016S Graduate Seminar in Toxicology/P. Wells and M. Havas
A full course description of this new course (as yet unassigned a number) will be available from the Graduate Coordinator, IES.

- ESE 2000H, Topics in Environmental Studies/Staff
- ESE 2000Y A special reading course designed individually for individual students, or very small groups of students to deal with advanced topics in environmental studies. Readings, papers and tutorials will be the form of this course.
- ESE 4444L Internship/Staff
- ESE 3001L (half course) Presenting Seminars/M. Havas
 NON-CREDIT, October-February. Pre-seminar preparation, structuring the seminar, stage fright, voice, body language, using slides and overheads, the art of communication, answering questions. Students have the opportunity to give two short seminars to the class and are evaluated by classmates. Videotape is used for self-evaluation. Offered 1986-87 and alternate years.
- ESE 3002L (half course) Writing Scientific Papers/M. Havas
 NON-CREDIT, October-February. What, when, where to publish; how to organize ideas, data, references; how to present figures and tables; how to respond to reviewers and editors; different writing styles; common grammatical mistakes. Alternates with ESE 3001L.

RELATED GRADUATE COURSES OFFERED BY OTHER GRADUATE DEPARTMENTS AND SCHOOLS

The following is a series of graduate courses offered in other departments in the University that may be of interest to students pursuing environmental studies. While the list is not complete and is really intended to be a preliminary guide for students who wish to orient their graduate programmes towards environmental studies, an effort has been made to incorporate as many relevant courses as possible. The courses are listed under the graduate departments which offer them.

For details of course content, pre-requisites and scheduling, the student is advised to consult the department concerned or the instructor.

Institute for Aerospace Studies

AER 1108S	Laser Remote Sensing	R.M. Measures
AER 1114F	Theory of Sound I	G.W. Johnston
AER 1115S	Theory of Sound II	G.W. Johnston

Department of Anthropology

ANT 1004Y	Primate Behaviour and Ecology	F.D. Burton
ANT 1008Y*	Paleopathology	F.J. Melbye
ANT 1011L	Human Variation	A. Ray
JAB 1036F/S	Archaeobotany	J.H. McAndrews
ANT 1037L	Faunal Archaeo-Osteology	H.G. Savage
ANT 1061Y*	Ecological Perspectives in Archaeology	Staff
ANT 1117H	Economic Anthropology	R.B. Lee

Department of Botany

BOT 1324H	Physiology and Ecology of Algae	J.A. Hellebust/ P.M. Stokes
BOT 1051Y	Advanced Plant Pathology	Z.A. Patrick
BOT 1070Y*	World Ecosystems	P. Maycock
BOT 1400H	Plant Evolution	S.C.H. Barrett/P. Sarkar
BOT 1430H	Ecological Plant Geography and Palynology	J.H. McAndrews
BOT 1530Y	Arctic Ecology	P. Maycock/J. Svoboda

Department of Chemical Engineering

CHE 1401S	Air Pollution Chemistry and Engineering	C.R. Phillips
CHE 1402S	Water Pollution Chemistry and Engineering	C.R. Phillips
CHE 1404S	Radiochemistry in Environmental Analysis	R.E. Jervis/ J.H. Aitken
CHE 1405F	Ionizing Radiation in the Environment	R.E. Jervis/ C.R. Phillips/J.H. Aitken
CHE 1413F*	Physical Chemistry of Aerosols	C.R. Phillips
CHE 1414S	Industrial Ventilation and Dust Control	H.D. Goodfellow
CHE 1416F	Effects of Industrial Hazards	M.A. Nazar/J.R. Nethercott & Staff
CHE 1418S	Atmospheric Dispersion and Air Pollution	J.W. Smith
CHE 2503S	Environmental Pathways	D. Mackay

Department of Civil Engineering (Environmental)

CIV 540F	Water and Pollution Control Engineering	T.B.A.
CIV 542S	Solid Waste Management	P.H. Jones
CIV 549S	Groundwater	J. Ganczarczyk/K.W.F. Howard
CIV 550F	Water Resources	B.J. Adams
CIV 1305S	Water Resources Systems Anal	B.J. Adams
CIV 1306S*	Environmental Engineering Design	J.G. Henry
CIV 1308F	Unit Operations and Processes of of Sanitary Engineering I	N.W. Schmidtke
CIV 1309S	Unit Operations and Processes of of Sanitary Engineering II	J. Ganczarczyk
CIV 1314S	Industrial Wastewater Control	J. Ganczarczyk
CIV 1319F	Water and Waste Analysis	J. Ganczarczyk
CIV 1337F*	Simulation in Civil Engineering	P.H. Byer
JMA 544S	Air Pollution and Control	J.G. Kawaii

Department of Forestry

FOR 1060Y	Forest Soils	V. Timmer
FOR 1071S	Land Use Hydrology Seminars	F.M. Buckingham
FOR 1310Y	Advances in Ecophysiology	T.J. Blake
FOR 1411Y	Forest Management	D.V. Love
FOR 1530F	Parks, Wilderness and Nature Preservation	P.L. Aird
FOR 1560Y*	Urban Forestry Issues	J.W. Andresen

Department of Geography

GGR 1402S	Land Management	J. van der Eyk
GGR 1411F*	Human Responses to Natural and Man-Made Environmental Hazards	I. Burton
GGR 1412S	Alternative Choices in Energy and Natural Resource Policies	A.P. Grima
JPG 1413H	Methods of Environmental Impact Assessment	J.B.R. Whitney/ V. MacLaren
GGR 1416S*	Environmental Perception	A. Whyte
GGR 1417S	Environmental Management in Arid and Semi-Arid Lands	R. Bryan
GGR 1418H	Rural Planning in Urbanizing Regions	M. Bunce

Department of Geology

GLG 2506H	Modern Carbonate Environments	D. Kobluk
GLG 2605H	Sedimentary Basin Analysis I	A.D. Miall
GLG 2606H	Sedimentary Basin Analysis II	A.D. Miall
GLG 2607H	Advanced Techniques in Hydrogeology	K. Howard
GLG 3610Y	Seminars in Ecology and Paleocology of Modern and Ancient Tropical Reefs	D. Kobluk

Department of Industrial Engineering

IND 1120F	Reliability	Staff
IND 1172F	Design of Energy Systems	J.S. Rogers/ O.J.C. Runnalls
IND 1202S	Current Problems in Human Factors Engineering	P.J. Foley

Department of Mechanical Engineering

MEC 1123H	Physical Aspects of Combustion	J.S. Wallace
MEC 1124H	Combustion in Internal Combustion Engines	A.B. Allan
MEC 1125H	Advanced Topics in Combustion	J.S. Wallace
MEC 1207H	Structure of Turbulent Flows	J.F. Keffer
MEC 1209H	Advanced Topics in Turbulent Flows	J.F. Keffer
MEC 1221H	Advanced Topics in Hydraulics	H.J. Leutheusser
MEC 1248H	Hydraulics of Open Channels	H.J. Leutheusser
JMA 544S	Air Pollution and Control	J.G. Kawall

Department of Sociology

SOC 6014H	Environmental Sociology I	W. Michelson
SOC 6114H	Environmental Sociology II (Urban and Community)	R. Gillis
SOC 6214H	Urbanization	R. Gillis
SOC 6314H	Community	W. Michelson
SOC 6414H	Urban Organization	B. Wellman

Department of Statistics

STA 1001F	Applied Regression Analysis	M.S. Srivastava
STA 1003S	Design of Sample Survey	Staff
STA 1004S	Experimental Design	Staff
STA 1005S	Applied Multivariate Analysis	Staff
STA 1101S	Methods of Applied Statistics	D. Andrews
STA 1102S	Time Series Analysis	Staff
STA 2103S	Introduction to Bayesian Inference	I. Guttman
STA 2104F	Introduction to Structural Inference	D. Brenner
STA 1810F	Introduction to Probability Theory	G. Templeton
STA 2111F	Probability Theory I	A. Lawniczak
STA 2112F	Mathematical Statistics I	D. Brenner
STA 2142S	Estimation and Testing I	Staff
STA 2162F	Statistical Inference I	A.S. Fraser
STA 2211F	Probability Theory II	A. Lawniczak
STA 2212S	Mathematical Statistics II	D. Brenner
STA 2342	Multivariate Analysis I	M.S. Srivastava
STA 3431F	Monte Carlo Methods	M. Evans

Department of Urban and Regional Planning

PLA 1601H	Environmental Planning & Policy	R. Jaakson/ V. Maclaren
PLA 1701	Regional Planning	R.R. White
JPG 1419S	Field Studies in Environmental Assessment	J.B.R. Whitney/ V. Maclaren

Department of Zoology

ZOO 1012Y	Environmental Factors	H.H. Harvey
ZOO 1013Y	Limnology	A.P. Zimmerman
ZOO 1028Y	Theoretical Ecology	J.E. Paloheimo
ZOO 1510Y	Aquatic Entomology	R. Mackay
ZOO 1516Y*	Seminar in Ecology	W.G. Sprules/N.C. Collins
ZOO 1518	Aquatic Microecology	H.A. Regier

*Not offered in 1986-87

GEORGE BURWASH LANGFORD FUND AND PRIZE

A generous donation to the Institute from Ms. Nona Macdonald of the University Department of Information Services had led to the establishment of the George Burwash Langford Fund and Prize. The purpose of the fund is to provide support and encouragement for student research in the Institute.

In May, 1980, at the luncheon held in celebration of the 20th Anniversary of the founding of the Great Lakes Institute, the Director announced the establishment of the prize named in honour of the first director of the Great Lakes Institute, Dr. George Burwash Langford.

The prize is to be awarded annually "to the registered graduate student who best combines excellence in research in environmental studies and contributions to the work of the Institute for Environmental Studies".

The hope is that the fund will grow large enough to support Fellowships and research activities and will not be limited to prizes. Donations may be made through the U. of T. Update Campaign.

The Langford Prize was first awarded in 1980 to Paul Scale (plant community response to sulphur dioxide) and Tom Whillans (the transformations of fish associations: a study in historical stress-response ecology). In the Spring of 1981 the recipients of the award were Gail Krantzberg (macrobenthos contributions to heavy metal cycling and toxicity in lake systems) and Nancy Patterson (wetland ecosystem response to cultural impacts). In 1982 the prize was awarded to Caroline Caza (the biology of Populus tremuloides Michx. on an unamended uranium mill tailings site near Bancroft, Ontario) and in 1983 to Darrell Marchand (carbon dioxide cycling in boreal and arctic regions). In 1984 the Prize was awarded to Deborah Martin who was studying historical changes in fisheries and land management of the Credit River. There were two recipients of the Langford Prize in 1985 - Gavin Christie and Raf Serafin. Mr. Christie's thesis title is "Indices of environmental temperature in relation to fish yields" while that of Mr. Serafin is "Attitudes to hazardous waste management siting in Niagara Falls: a survey study".

For the 1985/86 academic year, the Langford Prize was shared by two individuals who excelled academically while helping to run other activities around and about the Institute. Carol Murray, a Zoology collaborative student who studied gray squirrels as biomonitors of lead and cadmium in Metropolitan Toronto, was one winner. The other was Sarah Rang, a Botany/IES student, who investigated the uptake of heavy metals in the filamentous alga Cladophora in the Niagara River.

APPENDIX I

Members of Faculty, Research Interests, Selected Publications

AIRD, Paul L. (Ph.D., Cornell)

Professor, Faculty of Forestry and Member, Governing Council, University of Toronto; teaching and research in forest policy and the conservation of renewable resources; Associate, IES; the Ontario Forestry Association and the Royal Ontario Museum member; formerly employed with the Pulp and Paper Research Institute of Canada and Canadian International Paper Company.

FOR 407S Forest Policy and Administration

FOR 473F Parks and Recreation

FOR 1530F Parks, Wilderness and Nature Preservation

FOR 1610Y Natural Resource Policy

Selected Publications

Pine in perpetuity - The harvest of eastern White Pine and Red Pine timber from Ontario's Crown Forest. Agriculture Canada, Canadian Forestry Service, Petawawa National Forestry Institute, Information Report PI-X-52, 24p., (in press).

Enough evidence in, now it's time to act to beat acid rain. The Globe and Mail, March 13, 1986.

The conservation of Canada. Policy Options, May 1984, 11-12.

BARRETT, S.C.H. (Ph.D., Univ. California, Berkeley)

Chairman of NSERC Grants Panel for Population Biology

Research Interests

Plant population biology and evolution; evolutionary genetics of plant sexual systems, ecology and genetics of weeds, tropical biology.

Selected Publications

Crop mimicry in weeds. Economic Botany, 37, 1983, 255-282.

with S.D. Price and J.S. Shore, Male fertility and anisopleth population structure in tristylous Pontederia cordata. Evolution, 37, 1983, 745-749.

with D.E. Glover, On the Darwinian hypothesis of the adaptive significance of tristily. Evolution, 39, 766-774.

BENDELL, James F. (Ph.D., U. British Columbia)

Professor, Faculty of Forestry, University of Toronto

FOR 217F Resource Ecology

FOR 466Y Wildlife Ecology and Management

FOR 1555Y Problems in Wildlife Ecology

Research Interests

Population dynamics and habitat requirements of forest birds and mammals; interaction between wildlife and the forest; forest ecology.

Selected Publications

Blue grouse: effects on and influences of a changing forest. Forestry Chronicle, April 1985, 185-188.

A survey of the biology, ecology, abundance and distribution of the blue grouse (Genus Dendragapus). Grouse Populations, P. Hudson, (ed), World Pheasant Association, York University, England, 1985.

Population densities and habitats of spruce grouse in

Ontario. Resources and Dynamics of the Boreal Zone, R.W. Wein, R.R. Riewe and I.R. Methven (eds). Assoc. Can. Univ. North. Studies, Ottawa, 1983.

BLAKE, Terence J. (Ph.D., Melbourne, M.F., Yale)
Associate Professor, Faculties of Forestry and Botany
FOR 205F Morphology, Physiology and Genetics
FOR 351S Tree Physiology
FOR 1310Y Advances in Ecophysiology and Silviculture
Research Interests

Understanding physiological effects of environmental stresses on plants including drought, acid precipitation etc; interaction of genotype-environment-physiology on the quality of outplanted seedlings; whole plant physiology including role of water stress, carbohydrates, plant growth regulators on physiological functioning.

Selected Publications

with R.P. Pharis and D.M. Reid, Ethylene, gibberellins, auxin and the apical control of branch angle in a conifer, Cupressus arizonica. Planta 148, 64-68.

with D.M. Reid, Ethylene, water relations and tolerance of eucalypt species to water logging. Aust. J. Plant Physiol., 8, 497-505.

Transportation shock in white spruce: effects of cold storage and root pruning on water relations and stomatal conditioning. Physiol. Plant 57, 210-216.

BURTON, Ian (Ph.D., Chicago), FRSC
Vice-Chairman, International Federation of Institutes for Advanced Study (IFIAS).

Research Interests

Risk assessment; the perception and management of natural and man-made environmental hazards; people/environment theory. Current projects: ecological approaches to human settlements, urban/environment policy in developing countries.

Selected Publications

with A.V. Whyte (eds), Environmental Risk Assessment. John Wiley, Chichester, 1980.

with R. White, Approaches to the Study of the Environmental Implications of Contemporary Urbanization. Man and the Biosphere Programme, Technical Notes No. 14. Prepared in co-operation with IFIAS-Project Ecoville, UNESCO, Paris, 1983.

with R.W. Kates (eds), Geography, Resources and Environment, 2 vols. University of Chicago Press, Chicago, 1986.

BYER, Philip H. (Ph.D., Massachusetts Institute of Technology), P.Eng., Member, Ontario Environmental Assessment Advisory Committee, Associate Professor (Civil Engineering)
ESE 1005F Environmental Management I
CIV 542S Solid Waste Management
CIV 368F Engineering Economics and System Applications
CIV 1539S Evaluation of Civil Engineering Systems

Research Interests

The development and application of systems analysis and multiobjective techniques for evaluating public projects and policies; facility siting; risk management; solid waste

management; water resource, environmental, and transportation planning.

Selected Publications

with J. Dooley, Decision making for risk management. Living with Risk: Environmental Risk Management in Canada, Burton et al, (eds), Institute for Environmental Studies, 1982, 71-84.

with D.J.L. Forgie, Modelling the cost-effectiveness of sanitary landfill leachate control systems. Civil Engineering Systems, 1, 5, 1984, 261-269.

with R. Schwarz, Design of groundwater monitoring programs for waste landfill sites. Proceedings of Technology Transfer Conference No. 5, Ontario Ministry of Environment, Toronto, 1984, 603-636.

DAVIES, Katherine (D.Phil., Oxford)

City of Toronto Department of Public Health

ESE 1008S Environmental Management II

Research Interests

Environmental health; chemical contaminants of food and drinking water; environmental and human health effects of specific chemicals; pesticides and health; minimizing urban use of pesticides.

Selected Publications

Toronto's drinking water: A Chemical Assessment. City of Toronto Department of Public Health, 1984.

Does caulking hinder cockroach movement? Pest Control Technology, August 1985

A survey of cockroach complaints received by selected Canadian health departments, 1979-1984, Environmental Health Review, December, 1985.

DEWEES, Donald N. (Ph.D., Harvard)

Professor of Economics, Professor of Law

ESE 1001F Economics

ECO 313S Environmental Economics

ECO 320F Economic Analysis of Law

Environmental Law (Faculty of Law)

Research Interests

Environmental economics; energy conservation; occupational health.

Selected Publications

Instrument choice in environmental quality. Economic Enquiry, XXI, January, 1983, 53-71.

Economic incentives for controlling asbestos disease. Journal of Legal Studies, July, 1986.

Regulating environmental quality; The quality of consumer durables, and The control of diesel exhaust pollution, all in D.N. Dewees (ed), The Regulation of Quality: Products, Services, Workplaces, and the Environment. Butterworths, Toronto, 1983.

DONNAN, Jack (Ph.D., University of Rhode Island)

Senior Economist, Ontario Ministry of the Environment

ESE 1200S Environmental Economics

Research Interests

Measurement of environmental and intangible benefits; cost-benefit analysis and non-economic evaluation methods; micro and macro economic effects of environmental protection costs; industrial organization and public finance; policy development and implementation.

Selected Publications

Mercury Pollution on the Wabigoon-English River System: A Socio-Economic Assessment of Remedial Measures. Toronto, Ontario Ministry of the Environment, 1986.

The search for environmental quality, in C.G. Ruggeri (ed), The Canadian Economy: Problems and Policies, 3rd edition. Toronto, Gage Educational Publishing Ltd., (forthcoming).

The economics of acid precipitation - Ontario's socio-economic research programme. Ontario Ministry of the Environment, Toronto, 1982.

DOOLEY, James E. (Ph.D., Toronto), P.Eng.

Associate Professor, Faculty of Management Studies

ESE 1210F Environmental Risk Assessment

Research Interests

Research on systems for risk analysis and management with particular emphasis on developing countries in S.E. Asia. Risk profiles and allocation of resources to risk management activities.

Selected Publications

with R.T. Newkirk, A planning system to minimize environmental impact applied to route selection. Kybernetes, 5, 1976, 213-220.

A framework for environmental impact identification. Journal of Environmental Management, 9, 1979, 279-287.

Risk theory and the environmental assessment process, in Covello, V.T. et al, (eds) Environmental Impact Assessment, Technology Assessment, and Risk Analysis, Springer-Verlag, Berlin.

FEUER, George (Ph.D., Univ. Szeged, C.Med.Sc. Hungarian Academy of Sciences, FRIC, London, England)

Professor of Clinical Biochemistry and Pharmacology (Toxicology)

CLB 403F Clinical Biochemistry

PCL 473Y/JNP 1014Y Interdisciplinary Toxicology

PCL 474Y Toxicology Projects

Research Interests

Hepatic action of foreign compounds and mechanism of neoplasm formation; effect of mammary adenocarcinoma on the function of liver microsomes; effect of the pineal gland on human malignant melanoma.

Selected Publications

with F.A. De la Iglesia, Molecular Biochemistry of Human Disease. Vol. I, CRC Press, Boca Raton, 1985.

with A. Ghoshal, Structural requirements for progesterone binding to the hepatic endoplasmic reticulum in the female rat. Steroids, 43, 1984, 621-631.

with R.G. Cameron, Changes in progesterone binding and metabolism in liver microsomes from persistent hepatocyte nodules and hepatomas in male rats. *Cancer Res.*, 46, 76-80, 1986.

GRIMA, A.P. (Lino) (Ph.D., Toronto)

Associate Director, Institute for Environmental Studies; Chairman, Environmental Studies Panel, Ontario Graduate Scholarship Selection Board, 1985; Member, Board of Technical Experts, US-Canada Great Lakes Fishery Commission; Member, IJC Great Lakes Council of Research Managers

GGR 1412F Alternative Policies in Energy and Natural Resource Management

GGR 223Y Energy, Environmental and Natural Resource Management

ESE 1005F Environmental Management I

ESE 1008S Environmental Management II

Research Interests

Institutional mechanisms for pollution control; water resource management; climate impact assessment; demand analysis (water and energy resources); risk management; public participation; environmental education; Great Lakes.

Selected Publications

with R. Mason, Apples and oranges: towards a critique of public participation in Great Lakes futures, Canadian Water Resources Journal, 8(1), 1983, 22-50.

with C.R. Griffith, Complementary approaches to regulation in water quality management. B. Mitchell and J.S. Gardner (eds) River Basin Management: Canadian Experiences, University of Waterloo, Department of Geography Publication Series #20, 1983, 335-352.

Empirical basis for municipal water rates modification. Canadian Water Resources Journal, 9(3), 22-39, and 9(4), 1984, 62.

HARE, F. Kenneth (Ph.D., Université de Montréal)

Chairman, Canadian Climate Program Planning Board; Retired Provost, Trinity College, Toronto; Chairman, Royal Society of Canada, Commission on Lead in the Environment; President, Sigma Xi

GGR 101Y Environment and Man

GGR 355S Climate and Environmental Change

Research Interests

High-latitude climatology and biogeography; certain aspects of climatic change; arid zone climates, aspects of environmental contamination.

Selected Publications

with R.A. Bryson, (eds), Climates of North America, World Survey of Climatology Vol. II, Elsevier, Amsterdam, 1974, 420p.

with M.K. Thomas, Climate Canada, Wileys, Toronto, 1974, 256. (second edition, 1979, 230).

with A.M. Aikin, Nuclear waste disposal: technology and environmental hazards. Nuclear Energy and the Environment, E. El-Hinnawi (ed), The Pergamon Press, Oxford, 1980, 168-199. (Vol. II, Environmental Sciences and Applications, U.N. Environment Programme).

HAVAS, Magda (Ph.D., University of Toronto)
University Research Fellow/Assistant Professor
JBE 1434Y Applied Ecology

JBE 1435H Techniques in Applied Ecology
JNP 1016S Graduate Seminar in Toxicology

Writing Scientific Papers and Presenting Seminars: Non-credit courses for graduate students.

Research Interests

Effects of acid rain and metals (Al, Zn, Mn, Ni) on aquatic ecosystems (water chemistry, sediment chemistry; toxicity to aquatic invertebrates; bioaccumulation of metals by aquatic biota); well water quality in Ontario - impact of acidic deposition on trace metal concentrations; impact of Al, drought and low pH on sugar maple die-back.

Selected Publications

with T.C. Hutchinson and G.E. Likens, Red Herrings in acid rain research. Env. Sci. Tech. 18, 176A-186A.

with T.C. Hutchinson, The Smoking Hills: natural acidification of an aquatic ecosystem. Nature, 301, 23-27.

Aluminum bioaccumulation and toxicity to *Daphnia magna* in soft water at low pH. CJFAS, 42, 1985, 1741-1748.

HOWARD, K.W.F. (Ph.D., Birmingham)

Assistant Professor of Geology, Scarborough College
CIV 549S Groundwater

GLG 2607H Advanced Techniques in Hydrogeology
GLG B04F Exploration Techniques in Hydrogeology
GLG C09S Contaminant Hydrogeology

Research Interests

Involved in all aspects of hydrogeological research related to water resources and saline groundwater encroachment in Canada, U.K. and developing countries. Specific topics include: major ion, minor ion, and environmental isotope interpretation of aquifer systems; contaminant migration; down hole borehole logging; aquifer recharge assessment; resource development in central Africa; regional groundwater modelling; and radial flow modelling.

Selected Publications

with P. Beck, Hydrochemical interpretation of groundwater flow systems in quaternary sediments of southern Ontario. Canadian Journal of Earth Sciences, 1986, (in press).

The use of geochemistry and borehole geophysics in defining upper and lower boundaries of fissured aquifer systems. International Symposium on Karst Water Resources, Turkey, July 1985, (in press).

with P. Pilon and H. Falck, Regional geochemical stratification of groundwater resulting from catchment urbanization. Ontario MOE Technology Transfer Conference No. 6, Part 2. Water Quality Research, ISSN 0-825-491, Toronto, 1985, 160-183.

HUTCHINSON, Thomas (Ph.D., Sheffield)

Professor of Botany and Forestry, FRSC
JNP 1014Y Interdisciplinary Toxicology
JBE 1434Y Applied Ecology
JBE 1435H Techniques in Applied Ecology
BIO 233Y Introductory Ecology

with C.M. Adams, A comparison of the ability of leaf surfaces of three species to neutralize acidic rain drops. New Phytol. 97, 1984, 463-478.

Adaptation of plants to atmospheric pollutants. Ciba Symposium, Vol. 102, Origins and Development of Adaptation, Pitman Books, London, 1984, 52-72.

JAAKSON , Reiner (Ph.D., Waterloo; M.CIP)
Professor of Recreation and Tourism Geography
GGR 1420 Geography of Tourism
GGR 1803 Recreation Geography
GGR 1909 Social Survey Methods
GGR 1449 Environmental Geography
Research Interests

Second-homes; riparian recreation land and water management on the Rideau Canal.

Selected publications

Jurisdictional conflict in water withdrawal for the Trent Canal. Canadian Water Resources Journal, 1986.

Recreation and generic urban housing form. Environment and Behaviour, 18, 4, 1986.

Second home domestic tourism. Annals of Tourism Research, 13, 3, 1986.

JONES, Michael (B.Sc., Ph.D. in progress, U.B.C.)
Partner with ESSA Environmental and Social Systems Analysts Ltd
ESE 1006F Man-Environment Theory II
Research Interests

Adaptive environmental assessment and management; ecological modelling; environmental impact assessment and monitoring design; fisheries and aquatic biology; acidic precipitation.

Selected Publications

with L. Greig, Adaptive environmental assessment and management: a new approach to environmental impact assessment. New Directions in Environmental Impact Assessment, J. Whitney and V.W. Maclaren (eds), Methuen, (in press).

with G. Cunningham, D. Marmorek, P.M. Stokes, C. Wren and D. DeGraaf, Mercury release in hydroelectric reservoirs. Final report to the Canadian Electrical Association, 1986, 156p.

with D. Marmorek and G. Cunningham, Predicting the extent of damage to fisheries in inland lakes of eastern Canada due to acidic precipitation. Report to the Project Steering Committee, Department of Fisheries and Oceans, 1984, 91p.

JONES, Philip H. (Ph.D., Northwestern), P.Eng.
Consultant to World Health Organization.
JCN 1013F Environmental Microbiology
CIV 340S Municipal Engineering
CIV 542S Solid Waste Management
ESE 1008S Environmental Management II
Research Interests

Water and wastewater treatment; solid waste management; sanitary landfill sites; snow and ice control and salt application; environmental education.

Selected Publications

with P.H. Byer, Study of Professional Needs in Solid and

Hazardous Waste Management. Presented at the 6th National Conference on Waste Management in Canada, Vancouver, B.C., November 1984. Also a report to the Waste Management Branch of Environment Canada.

with J. Szekely, Studies in the production of volatile fatty acids in the anaerobic digestion of municipal sludge, Can. J. Water Pollution Res., 21, 1986.

with A.D. Tadwalkar and C.L. Hsu, Enhanced uptake of phosphorus by activated sludge: effect of substrate addition. Water Research, 1986 (in press).

KALOW, Werner (M.D., Koenigsberg)

Professor of Pharmacology

JNP 1014Y Interdisciplinary Toxicology

Research Interests

Pharmacogenetics and Ecogenetics. Current projects: A study of hereditary differences in human capacity to metabolize drugs and toxic agents; implications for the setting of safety standards and for drug therapy.

Selected Publications

with Denis M. Grant and Bing K. Tang, Variability in caffeine metabolism. Clinical Pharmacology and Therapeutics, 33(5), 591-602.

with G. Carro-Ciampi and S. Gray, Paraoxonase phenotype distribution in Canadian Indian and Inuit populations. Can. J. Physiology and Pharmacology, 61(4), 1983, 336-340.

with H.W. Goedde, D. Agarwal (eds), Ethnic Differences in Reactions to Drugs and Xenobiotics. Liss, New York, 1986.

MACKAY, Donald (Ph.D., Glasgow), P.Eng, FCIC

Professor (Chemical Engineering and Applied Chemistry); member, Canadian Environmental Advisory Council

CHE 2503S Environmental Pathways

Research Interests

Environmental fate and effects of toxic organic chemicals, particularly partitioning, transport bioaccumulation and toxicity; behaviour and effects of oil spills in marine and terrestrial systems, especially in the Arctic.

Selected Publications

with M.M. Miller, S.P. Wasik, G.L. Huang, W.Y. Shin, Relationships between octanol-water partition coefficients and aqueous solubility. Environ. Sci. Technol., 19, 1985, 522-529.

Air/water exchange coefficients, in Environmental Exposure from Chemicals, vol. 1, W.B. Neely and G.E. Blau (eds). CRC Press, Boca Raton, 1985, 91-108.

with S. Paterson, A pharmacokinetic model of styrene inhalation with the fugacity approach. Toxicol. Appl. Pharmacol., 1986, 444-453.

MACLAREN, Virginia W. (Ph.D., Cornell)

Assistant Professor of Geography

GGR 1413F Methods of Environmental Assessment

GGR 1419S Field Studies in Environmental Assessment

GGR 1449H Current Research Approaches in Environmental Geography

PLA 1601S Environmental Planning and Policy Analysis

PLA 1005F Decision Analysis

GGR 333F Canadian Energy: Geography and Policy Issues

Research Interests

Multiple decision maker conflicts and bargaining; multicriteria evaluation; environmental impact assessment; recycling and energy-from-waste.

Selected Publications

with J.B.R. Whitney (eds), New Directions in Environmental Impact Assessment: The Canadian Experience, Methuen, Toronto, 1985, 245p.

Multicriteria Evaluation. New Directions in Environmental Impact Assessment: The Canadian Experience, V.W. Maclaren and J.B.R. Whitney (eds), Methuen, 1985, 221-245.

with J.B.R. Whitney, Assessing social impacts in an energy-from-waste project. Proceedings, Facility Siting and Routing '84: Energy and Environment, 1984, 624-644.

MICHELSON, William (Ph.D., Harvard)

Past-chair of the American Sociological Association's section on Environmental Sociology

SOC 200Y Introduction to Social Research

SOC 385Y Social Ecology

SOC 6014S Urban and Environmental Sociology

Research Interests

Urban and environmental sociology, particularly the impact of the urban, built environment regarding vulnerable population subgroups; time geography.

Selected Publications

Man and his Urban Environment: A Sociological Approach, Addison-Wesley, 1970, 1976.

Environmental Choice, Human Behaviour, and Residential Satisfaction, Oxford University Press, 1977.

From Sun to Sun: Daily Obligations and Community Structure in the Lives of Employed Women and their Families, Rowman and Allanheld, 1985.

NEUMAN, Keith (Ph.D., Univ. of California, Irvine)

Sociologist, Ontario Ministry of the Environment

ESE 1206S Social Impacts of Environmental Change

Research Interests

Social and psychological dimensions of environmental resource and technology-related change; social impact assessment; public participation and dispute resolution; risk perception and risk communication.

Selected Publications

Personal values and commitment to energy conservation. Environment and Behaviour, 18, 1986, 53-74.

Trends in public opinion on acid rain: a comprehensive review of existing data. WASP, in press.

Social and behavioral perspectives on energy conservation: reviewing the state of the art. Journal of Environmental Psychology, 2, 1982, 141-148.

REGIER, Henry A. (Ph.D., Cornell)
Commissioner, Great Lakes Fishery Commission.
ESE 1007F Man-Environment Theory I
ZOO 480Y Aquatic Macrosystems
ZOO 1518Y Aquatic Macro-Ecology

Research Interests

Interdisciplinary science of environmental resources; rehabilitation of stressed aquatic ecosystems; comparative fisheries limnology; life history simulation of fish populations.

Selected Publications

with A.P. Grima, The nature of Great Lakes ecosystems as related to transboundary pollution. International Business Lawyer, June 1984, 261-269.

with G.R. Francis, A.P. Grima and T.H. Whillans, A Prospectus for the Managment of the Long Point Ecosystem. Ann Arbor, MI, Great Lakes Fish. Comm. Tech. Rep. 42, 1985.

with G.L. Baskerville, Sustainable redevelopment of regional ecosystems degraded by exploitive development. In W.C. Clark and R.E. Munn (eds), Sustainable Development of the Biosphere. Cambridge Univ. Press, 1986.

ROY, D.N. (Ph.D., Calcutta) FRSC

Professor of Forestry.

FOR 104S Forest Chemistry II

FOR 333F Chemistry and Biochemistry of Wood

FOR 1231F Biogenesis of Wood Components I

FOR 1232S Biogenesis of Wood Components II

Research Interests

Plant biochemistry; fungicides; herbicide decay in boreal forest soils; fiber chemistry; biomass energy; acid rain.

Selected Publications

with S. Pathak and D.V. Love, Determination of a chemical basis of air pollution stress in wood of mature white pine trees in susceptible forest ecosystems. Journal of Water, Air and Soil Pollution (accepted).

with G. Deka, Chemical and physical aspects of pulping fast growing hybrid species of Ontario. Int. Symposium of Wood and Pulping Chemistry, Vancouver, B.C., August 1985.

with S. Krigstin, Contribution of chemical components in juvenile hybrid Salix spp. to its total energy output. 39th Annual Meeting, Forest Products Research Society, Orlando, Florida, June 1985.

STOKES, Pamela, (Ph.D., Bristol)

Director, Institute for Environmental Studies; National Academy of Science/Royal Society of Canada Committee on Acid Precipitation; Vice-Chairman, Commission on Lead in the Canadian Environment, Royal Society of Canada; Member Ontario Pesticides Advisory Committee.

ESE 1008S Environmental Management II

BOT 202Y Plants and Society

BOT 460Y Project in Botany

JBE 1434Y Applied Ecology

BOT 324S Physiology and Ecology of Algae

Research Interests

Algae of extreme environments especially low pH and metal polluted water bodies; mechanisms of tolerance to metals; metal cycling in acid lakes; ecology of acid tolerant algae; second order effects of lake acidification; reclamation of severely damaged ecosystems; pesticide residues and pathways in tropical ecosystems; pesticide residues and pathways in tropical ecosystems.

Selected Publications

with P.G. Campbell, Acidification and toxicity of metals to biota. Can. J. Fish. Aqu. Sci., 42, 1985, 2034-2049.

with G. Krantzberg, Benthic macroinvertebrates modify copper and zinc partitioning in freshwater/sediment microcosms. Can. J. Fish. Aqu. Sci., 42, 1985, 1423-1465.

Monitoring and modelling of agrochemical flows and pathways through ecosystems. In Risk Assessment of Agrochemicals in the Eastern Caribbean: Proceedings of a CARDI/UNESCO-MAB workshop, 1985, 157-174.

STREN, Richard (Ph.D., University of California, Berkeley)

Associate Professor of Political Science

POL 2409Y Politics and Planning in Third World Cities

POL 2600Y Comparative Public Administration and Policy Analysis

Research Interests

Comparative public administrative and organization theory; contemporary African administration; third world urban survey research; African urbanization.

Selected Publications

Housing the Urban Poor in Africa: Policy, Politics and Bureaucracy in Mombasa, Institute of International Studies, Berkeley, 1978.

Urban Policy. In Joel D. Barkan (ed), Politics and Public Policy in Kenya and Tanzania (RW. edition) Praeger, New York, 1984, 233-64.

L'état au risque de la ville, Politique africaine, 17, March 1985, 74-87.

SWAIGEN, John (L.L.M., Osgoode Hall, Toronto)

Ministry of the Environment

ESE 1002F Environmental Law

Research Interests

Environmental law and policy; public interest law; law enforcement

Selected Publications

Environment on Trial, Estrin and Swaigen (eds), Canadian Environmental Law Research Foundation, Toronto, 1978.

How to Fight for What's Right: A Citizen's Guide to Public Interest Law, James Lorimer and Co., Toronto, 1981.

Compensation of Pollution Victims in Canada, Economic Council of Canada, Ottawa, 1981.

SVOBODA, J. (Ph.D. Univ. Alberta)

Professor of Botany, Erindale Campus

JBG 230y Man and Environment

BIO 330Y (BOT 1530Y) Plant Ecology

BIO 433H (BOT 1533Y) Arctic Ecology

Research Interests

Functioning of isolated arctic ecosystems (oases); boundaries of high arctic ecoregions; fallout radionuclides in arctic environments; effect of landscape fire on concentration and redistribution of man induced pollutants; effects of nuclear winter in the boreal and tundra zone of Canada.

Selected Publications

with G.H.R. Henry and B. Freedman, Survey of vegetated areas and Muskox populations in East-Central Ellesmere Island. Arctic, 39, 1986, 78-81.

with H.W. Taylor and T.T. Lei, Survey of the Keewatin uranium mineralization areas with respect to natural occurrences of radionuclides in vegetation, soils and sediments. Monograph published by Department of Indian Affairs, Arctic Land Use Research Program (ALUR), 63p, (in press).

with E.A. Hutchinson-Benson and H.W. Taylor, The latitudinal inventory of ^{137}Cs in vegetation and top soil in northern Canada. Can. J. Bot., 63, 1985, 784-791.

TIMMER, V.R. (Ph.D., Cornell)
Associate Professor of Forestry
FOR 211F Forest Soils I
FOR 456S Forest Soils II
FOR 1060Y Advanced Forest Soils

Research Interests

Impact of forest management practices on soils; mineral nutrition of trees; soil fertility diagnosis; forest site productivity evaluation; soil and foliage analysis in forestry; nursery soil management; containerized tree seedling production.

Selected Publications

Response of a hybrid poplar clone to soil acidification and liming. Can. J. Soil Sci., 65, 1985, 727-735.

with J. Parton, Optimum nutrient levels for container growing media determined by saturated aqueous extract. Commun. Soil Sci. Plant Anal. 15, 1984, 607-618.

with L.D. Morrow, Predicting fertilizer growth response and nutrient status of jack pine by foliar diagnosis. Forest Soils and Treatment Impacts. E.L. Stone (ed) Proc. 6th North Am. For. Soil Conf., Knoxville, 1984, 335-351.

TRICK, Charles (Ph.D., University of British Columbia)
Assistant Professor and University Research Fellow, University of Toronto

Research Interests

Mechanisms of microbial adaptation to environmental stress; trace metal and iron metabolism in aquatic microbes; biochemical markers of nutritional stresses; molecular genetics of iron uptake.

Selected Publications

with P.J. Harrison and R.J. Andersen, The influence of environmental factors on the production of an antibacterial metabolite by Prorocentrum minimum. Can. J. Fish. Aquat. Sci. 41, 1984, 423-432.

Hydroxamate-siderophore production by marine gram-negative eubacteria isolated from oligotrophic waters. Applied

Environ. Microbiol., 1986, (submitted).

with A. Gillam, Iron-chelators and uptake. Cyano bacteria: Current research, P. Fay and C. Van Baalen (eds). El servier Scientific Publishers, 1985.

VAN LOON, Jon C. (Ph.D., University of Toronto)

Professor of Geology and Chemistry

GLG 2402H Instrumental Methods of Rock and Mineral Analysis

CHE 1414H Industrial Ventilation and Dust

GLG 400H Environmental Geochemical Analysis

Research Interests

Trace element analysis with particular emphasis on the toxic metals; instrument development; introduction of solid samples into atomizers used in analytical atomic spectrometry for direct solid sample analysis; determination of the chemical forms of the elements (speciation) in environmental, biological, ecological and clinical samples.

Selected Publications

with D.A. Naranjit and B.H. Radziuk, A Zeeman-Effect based scatter correction system for non-dispersive atomic fluorescence spectrometry. Spectrochim. Acta 39B, 969, 1984.

with M.C. Nimjee, R.R. Barefoot and M.A. Balicki, Solids introduction to an ICP emission spectrometer for the determination of trace metals in air filters. Spectroscopy, Letters 17, 1984, 245.

Selected Methods of Trace Metal Analysis - Biological and Environmental Samples, John Wiley and Sons, 357p, 1985.

WELLS, Peter G. (Pharm.D., University of Minnesota)

Assistant Professor of Pharmacy and Pharmacology

JNP 1014Y Interdisciplinary Toxicology

ANA 1008Y Advanced Human Embryology and Teratology

JNP 1016S Graduate Seminar in Toxicology

PCL 474Y Project in Toxicology

PCL 362S Introductory Toxicology

Research Interests

Toxicology of drugs that are bioactivated to a reactive intermediate; influence of chemicals, physiology and pathophysiology on chemical biotransformation and pharmacodynamics. Current projects: chemical hepatotoxicity, teratogenesis and ocular toxicology in animals and humans. Approach: subcellular, cellular, organ culture and in vivo methods.

Selected Publications

with J. Feely, G.R. Wilkinson and A.J.J. Wood, Effect of thyrotoxicosis on liver blood flow and disposition of propranolol after chronic dosing. Clin. Pharmacol. Ther., 33, 1983, 603-608.

with P. Ramji and M.S.W. Ku, Delayed enhancement of acetaminophen hepatotoxicity by general anesthesia using diethyl ether or halothane. Fundam Appl. Toxicol., 6, 1986, 229-306.

with J.T. Lum, Pharmacological studies on the potentiation of phenytoin teratogenicity by acetaminophen. Teratology, 33, 1986, 53-72.

WESTGATE, John (Ph.D., University of Alberta)
Councillor, American Quaternary Association
GLGA01Y Introductory Geology
GLGC08S Quaternary Stratigraphy
GLGB03S Field Comp I: Appalachian Mobile Belt

Research Interests

Stratigraphic application of tepha; fission-track dating; palaeomagnetism, quaternary geology of the Toronto-Markham region.

Selected Publications

Geochronology, stratigraphy, and geochemistry of Cindery Tuff in hominid-bearing Pliocene sediments of the Middle Awash, Ethiopia. *Nature*, 307, 1984, 26-31.

Dating methods of Pleistocene deposits and their problems: tephnochronology and fission-track dating. *Geoscience Canada*, Reprint Series 2, 1985.

Quaternary geology of the Markham area, southern Ontario: a map, Ontario Geological Survey, Preliminary Map, Open File Report, 1984.

WHITE, Rodney R. (Ph.D., Bristol)
Associate Professor of Geography, Co-ordinator of Project Ecoville
GGR 1610 Regional Development
PLA 1701 Regional Planning
ESE 1206S Social Impacts of Environmental Change

Research Interests

Environmental implications of rapid urbanization; infrastructure planning; West Africa.

Selected Publications

With Ian Burton (eds), Approaches to the Study of the Environmental Implications of Rapid Urbanization. MAB Technical Notes 14, UNESCO, Paris, 1983.

with Christian Dufournand, Un modele inter-regional des interactions entre l'urbanisation et l'environnement: le cas du Senegal. *Canadian Journal of Regional Science*, VIII, 2, 1985, 181-201.

The impact of policy conflict on the implementation of a government-assisted housing project in Senegal. *Canadian Journal of African Studies*, 19, 3, 1985, 505-529.

WHITNEY, Joseph B.R. (Ph.D., Chicago)
Consultant to Ford Foundation on Environmental Studies
GGR 1413H Methods of Environmental Assessment
GGR 1706F Studies in the Regional Development of China, 1850 to Present
GGR 1419H Field Studies in Environmental Assessment
GGR 1709H Regional Development of Japan

Research Interests

Environmental impact assessment; political geography; resource management, East Asia and Africa; Project Ecoville.

Selected Publications

with Virginia Maclaren (eds), Environmental Impact Assessment Current Approaches in the Canadian Context, University of Toronto, Institute for Environmental Studies Monograph Series, Monograph No. 5, 1985, 300p.

with Virginia Maclaren (eds), New Directions in Environmental Impact Assessment in Canada, Methuen LI-J, Toronto, 1985.

WYNDHAM, R. Campbell (M.Sc. Guelph, Ph.D Calgary)

Assistant Professor of Botany

JBM 1437Y Microbial Ecology

BOT 301H Marine Biology Field Course

BOT 202Y Plants in Society

BIO 110Y Biology

Research Interests

Organic contaminants in the environment; biodegradation of chlorinated aromatics; wastewater treatment; evolution of catabolic pathways for pollutant degradation in bacteria.

Selected Publications

Evolved aniline catabolism in Acinetobacter calcoaceticus during continuous culture of river water. Appl. Environ. Microbiol. 51, 1986, (in press).

Adaptation of estuarine bacteria to toluene at low concentrations in seawater: Co-metabolism of toluence. Can. J. Microbiol., 31, 1985, 910-918.

with J.W. Costerton, Heterotrophic potentials and hydrocarbon biodegradation potentials of sediment microorganisms within the Athabasca Oil Sands deposit. Appl. Environ. Microbiol., 41, 1981, 783-790.

APPENDIX II

Master's Candidates in Residence

ABBOTT, Robert M., B.A. Hons. (University of Victoria), 1984.
Economic impact of non-resident recreational fishing in Ontario using input-output analysis.
Supervisor: A.P. Grima (Geography)

ADAIR, Michael, B.A. (University of Wilfred Laurier), 1985.
Park policy and planning, the geography of tourism, water resources management.
Supervisor: R. Jackson (Geography)

ATKINSON, Susan M., B.Sc. (University of New Brunswick), 1980.
Physiological effects of acid precipitation on sugar maple and jack pine seedlings.
Supervisor: P.L. Aird and T. Blake (Forestry)

CHRISTIE, Gavin, B.Sc. (University of Toronto), 1981.
Focus on the relationship between long term fish yields and environmental temperature in large inland lakes.
Supervisor: H.A. Regier (Zoology)

CREED, Irena, B.Sc. (University of Toronto), 1985.
Investigating mechanisms of metal toxicity, tolerance and co-tolerance in the algae Chlorella saccharophila.
Supervisor: M. Havas (IES)

JOHNSON, Martha, B.A. Hons. (McGill University).
Inuit environmental perceptions as applied to education.
Supervisor: W.N. Irving (Anthropology)

KINCH, Craig, B.Sc. (University of Toronto), 1985.
Soil factors in sugar maple decline in Ontario.
Supervisor: T.C. Hutchinson (Botany)

MACDONALD, Mary E., B.A. Hons. (University of Toronto), 1981.
Environmental impact assessment and technology transfer with special emphasis on the manufacture of charcoal in developing countries.
Supervisor: J.B.R. Whitney (Geography)

MACLEOD, David T., B.Sc. Hons. (Carleton University), 1984.
Class environmental assessments in the federal context.
Supervisor: V. Maclaren (Geography)

MCCLUSKEY, David, B.A. (York University), 1975.
Ecological biorehabilitation in an urban setting.

MILLER, Bradley, B.Sc.FE (University of N.B.), 1984.
Subsequent influence during drought of the effect of low soil temperatures on root growth and relation patterns of black spruce seedlings.
Supervisor: T. Blake (Forestry)

- MURRAY**, Carol, B.Sc. (McGill University), 1984.
Analysing grey squirrels' tissues for trace metals (Pb, Cd, Zn, Mn etc.) and comparing rural, urban and suburban populations.
Supervisor: J. Bendell (Zoology)
- NIELSEN**, Chris, B.A. Hons (Brock University), 1983.
The introduction of individual transferable quotas and their effects on the commercial fishing industry in Lake Erie and Georgian Bay.
Supervisor: A.P. Grima (Geography)
- PAJOS**, Tiina, B.Sc. (University of Toronto), 1985.
Effects of pH, aluminum and drought on sugar maple seedlings.
Supervisor: V. Timmer (Forestry)
- PATHAK**, Saroj, M.Sc. (Panjab University, India), 1971.
The influence of acid rain on the chemical composition of boreal forestry.
Supervisor: D.N. Roy (Forestry)
- PILON**, Patricia, B.Sc. (McMaster University), 1981.
Investigation of the distribution, origins and behaviour of shallow groundwaters containing elevated concentrations of chloride, Duffins Creek-Rouge River Basin.
Supervisor: K. Howard (Geology)
- RANG**, Sarah, B.Sc. Hons. (University of Western Ontario), 1983.
The uptake and loss of cadmium, lead and mercury in Cladophora glomerata in the Niagara River.
Supervisor: P. Stokes (Botany)
- REUBER**, Barbara, B.A.Sc. (University of Toronto), 1980.
Modelling chemical transfer at the sediment-water interface.
Supervisor: P. Stokes (Botany)
- ROBERTS**, Carmen, B.A. (University of Toronto), 1985.
Supervisor: A.P. Grima (Geography)
- SPECK**, Brian, B.A. (University of Toronto), 1985.
Processes and management of desertification in south-central Canada.
Supervisor: J.B.R. Whitney (Geography)
- STEPHENSON**, Tasha, B.Sc. (Queen's University), 1983.
Investigation of fish utilization of coastal marshes along the Lake Ontario shoreline in the Toronto area.
Supervisor: H.A. Regier (Zoology)
- TARMOHAMED**, Yasmin, B.Sc. (University of Toronto), 1985.
The role of the cell wall in the uptake of metals in Chlamydomonas reinhardtii.
Supervisor: P.M. Stokes (Botany)

APPENDIX III

1985/86 Projects centred at IES

Allocating fisheries resources in the Great Lakes.	A.P. Grima
International Institute of Applied Systems Analysis for the sustainability of world's biospheres.	A.P. Grima/ R.E. Munn
Testing and adapting staining techniques for locating metals in aquatic biota.	M. Havas
Aquatic toxicology.	M. Havas
Effect of acid deposition on well water and tap water quality in south-central Ontario	M. Havas
Hydrocarbon toxicity to algae.	T.C. Hutchinson
Metal tolerance in grasses invading the Sudbury mining area.	T.C. Hutchinson
Sugar maple and yellow birch die-back in Quebec/Ontario: are soil factors involved?	T.C. Hutchinson
The comparative effects of sulphuric and nitric acid rain on boreal forest species.	T.C. Hutchinson
Anaerobic digestion of petroleum sludges.	P.H. Jones
Intensive workshop and hazardous waste treatment and disposal.	P.H. Jones
SAP Anaerobic digestion studies.	P.H. Jones
Absorbant polymer transport studies.	P.H. Jones/ K.W.F. Howard
Phytoplankton populations in soft water lakes as related to acidification.	Y. Kit-Yung/ P. Stokes
Early emergent insects study.	G. Krantzberg/ P. Stokes
A study of hydrocarbon partitioning in the marine environment.	D. Mackay
Studies on the simultaneous evaporation and spreading of chemical spills on snow and ice.	D. Mackay
Development of predictive organic contaminant structure-property-toxicity relationships for aquatic organisms.	D. Mackay
Sustainable development of the biosphere: A Canadian focus.	H. Regier
Study of the impact of dredging and dredged materials on Hamilton Harbour fisheries: implications for rehabilitation.	H. Regier/ J. Holmes
Definite synthesis of Canadian ecosystem information on freshwater resources relevant to binational negotiations especially concerning the Great Lakes	H. Regier et al.
Rehabilitation of fish resources in the Toronto area.	R. Steedman/ H. Regier
Environmental behaviour of toxic substances including oil.	P. Stokes
Pesticides.	P. Stokes
Biogeochemical cycling of mercury in remote lakes: a mechanistic approach.	P. Stokes

The influence of lake acidity on community dynamics of benthic invertebrates and algal littoral epiphyte assemblages.	P. Stokes/ T. Howell/ R. France
Mechanisms of metal cycling between aquatic insects and terrestrial wildlife.	P. Stokes/ G. Krantzberg
The effects of low levels of methyl mercury and PCBs on mink reproduction (Toxic Chemicals Prog.)	P. Stokes/ C. Wren
Urban growth management in Africa.	R. Stren
Iron stress and aquatic toxicity in aquatic microbes: an experimental approach.	C. Trick
Iron assimilation in dinitrogen fixing cyanobacteria.	C. Trick
Screening methods for air and water samples: application of Inductively Coupled Plasma.	J.C. Van Loon
Mass Spectrometry (ICP/MS) to elemental analysis	
Operation and maintenance of inductively coupled argon plasma emission spectograph.	J.C. Van Loon/ and staff
Project Ecoville Rapid Urbanisation in developing countries.	R.R. White

